

# *Bill's School and Mine*

BY

*W. S. Franklin*





Class 24

Book 1

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# BILL'S SCHOOL AND MINE

A COLLECTION OF ESSAYS  
ON EDUCATION

BY

WILLIAM SUDDARDS FRANKLIN

SOUTH BETHLEHEM, PENNSYLVANIA  
FRANKLIN, MACNUTT AND CHARLES  
PUBLISHERS OF EDUCATIONAL BOOKS

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By WILLIAM S. FRANKLIN

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DEDICATED  
TO A UNIVERSITY  
SUPPORTED AND CONTROLLED  
BY THE PEOPLE OF  
PENNSYLVANIA.

The time will come when men will think of nothing but  
education.

NIETSCHE.

## PREFACE.

The greater part of the essay, *Bill's School and Mine*, was written in 1903, but the title and some of the material were borrowed from my friend and college mate William Allen White in 1912, when the essay was printed in the *South Bethlehem Globe* to stimulate interest in a local Playground Movement.

The second essay, *The Study of Science*, is taken from Franklin and MacNutt's *Elements of Mechanics*, The Macmillan Company, New York, 1908. I have no illusions concerning the mathematical sciences, for it is to such that the essay chiefly relates. Unquestionably the most important function of education is to develop personality and character; but science is impersonal, and an essay which attempts to set forth the meaning of science study must make an unusual demand upon the reader. Some things in this world are to be understood by sympathy, and some things are to be understood by serious and painful effort.

The third essay, *Part of an Education*, was privately printed in 1903 under the title *A*

*Tramp Trip in the Rockies*, and it is introduced here to illustrate a phase of real education which is in danger of becoming obsolete. The school of hardship is not for those who love luxury, and to the poverty stricken it is not a school—it is a Juggernaut.

The five minor essays are mere splashes, as it were; but in each I have said everything that need be said, except perhaps in the matter of exhortation.

For the illustrations I am under obligations to my cousin Mr. Daniel Garber of Philadelphia.

WILLIAM SUDDARDS FRANKLIN.

SOUTH BETHLEHEM, PA.,

October 22, 1913.

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# BILL'S SCHOOL AND MINE

It seems that the Japanese have domesticated nature.

LAFCADIO HEARNE.



I always think of my school as my boyhood. Until I was big enough to swim the Missouri River my home was in a little Kansas town, and we boys lived in the woods and in the water all Summer, and in the woods and on the ice all Winter. We trapped and hunted, we rowed and fished, and built dams, and cut stick horses, and kept stick-horse livery stables where the grape-vines hung, and where the paw-paws mellowed in the Fall. We made mud slides into our swimming hole, and we were artists in mud-tattoo, painting face and body with thin black mud and scraping white stripes from head to foot. We climbed the trees and cut our names, we sucked the sap of the box elder and squashed poke berries for war paint. We picked wild grapes and gooseberries, and made pop-guns to shoot green haws. In the Autumn we gathered walnuts, and in the Spring we greeted the johnny-jump-ups, and the sweet williams as they peered through the mold.

Always, we boys were out of doors, as it seems to me; and I did the chores. It is something to learn the toughness of hickory under the saw, how easily walnut splits, how mean elm is to

handle; and a certain dexterity comes to a boy who teaches a calf to drink, or slops hogs without soiling his Sunday clothes in the evening. And the hay makes acrobats. In the loft a boy learns to turn flip-flops, and with a lariat rope he can make a trapeze. My rings were made by padding the iron rings from the hubs of a lumber wagon and swinging them from the rafters.

Bill, little Bethlehem Bill, has a better school than I had; the house and the things that go with it. Bill's teachers know more accurately what they are about than did my teachers in the old days out West half a century ago. And, of course, Bill is getting things from his school that I did not get. But he is growing up with a woefully distorted idea of life. What does Bill know about the woods and the flowers? Where in Bill's makeup is that which comes from browsing on berries and nuts and the rank paw paw, and roaming the woods like the Banderlog? And the crops, what does he know about them?

The silver-sides used to live in the pool under the limestone ledges by the old stone quarry where the snakes would sun themselves at noon. The wild rose, with its cinnamon-scented flower and curling leaves, used to bloom in May for

me—for me and a little brown-eyed girl who found her ink-bottle filled with them when the school bell called us in from play. And on Saturdays we boys roamed over the prairies picking wild flowers, playing wild plays and dreaming wild dreams—children's dreams. Do you suppose that little Bill dreams such dreams in a fifty-foot lot with only his mother's flowers in the window pots to teach him the great mystery of life?

Bill has no barn. I doubt if he can skin a cat, and I am sure he cannot do the big drop from the trapeze. To turn a flip-flop would fill him with alarm, and yet Jim Betts, out in Kansas, used to turn a double flip-flop over a stack of barrels! And Jim Betts is a man to look at. He is built by the day. He has an educated body, and it is going into its fifties with health and strength that Bill will have to work for. And Jim Betts and I used to make our own kites and nigger-shooters and sleds and rabbit traps.

Bill's school seems real enough, but his play and his work seem rather empty. Of course Bill cannot have the fringe of a million square miles of wild buffalo range for his out-of-doors. No, Bill cannot have that. Never, again. And to imagine that Bill needs anything of the kind is to

forget the magic of Bill's "make-believe!" A tree, a brook, a stretch of grass! What old-world things Bill's fancy can create there! What untold history repeat itself in Bill's most fragmentary play! Bill, is by nature, a conjuror. Give him but little and he will make a world for himself, and grow to be a man. Older people seem, however, to forget, and deprive Bill of the little that he needs; and it is worth while, therefore, to develop the contrast between Bill's school and that school of mine in the long-ago land of my boyhood out-of-doors.

The Land of Out-of-Doors! What irony there is in such glowing phrase to city boys like Bill! The supreme delight of my own boyhood days was to gather wild flowers in a wooded hollow, to reach which led across a sunny stretch of wild meadow rising to the sky; and I would have you know that I lived as a boy in a land where a weed never grew.\* I wish that Bill

\* The western prairies, except in the very center of the Mississippi Valley, are beautifully rolling, and they meet every stream with deeply carved bluffs. In the early days every stream was fringed with woods; and prairie and woodland, alike, knew nothing beyond the evenly balanced contest of indigenous life. There came, however, a succession of strange epidemics, as one after another of our noxious weeds gained foothold in that fertile land. I remember well several years when dog-fennel grew in every nook and corner of my home town in Kansas; then, after a few years, a variety of

might have access to the places where the wild flowers grow, and above all I wish that Bill might have more opportunity to see his father at work. A hundred years ago these things were within the reach of every boy and girl; but now, alas, Bill sees no other manual labor than the digging of a ditch in a cluttered street, or stunted in growth, he has almost become a part of the machine he daily tends, and Boyville has become a paved and guttered city, high-walled, desolate, and dirty; with here and there a vacant lot hideous with refuse in early Spring and overwhelmed with an increasing pestilence of weeds as the Summer days go by! And the strangest thing about it all is, that Bill accepts unquestioningly, and even with manifestations of joy, just any sort of a world, if only it is flooded with sunshine.

I remember how, in my boyhood, the rare advent of an old tin can in my favorite swimming hole used to offend me, while such a thing as a cast-off shoe was simply intolerable, and I won-

thistle grew to the exclusion of every other uncultivated thing; and then followed a curious epidemic of tumble-weed, a low spreading annual which broke off at the ground in the Fall and was rolled across the open country in countless millions by the Autumn winds. I remember well my first lone "beggar louse," and how pretty I thought it was! And my first dandelion, and of that I have never changed my opinion!

der that Bill's unquenchable delight in out-door life does not become an absolute rage in his indifference to the dreadful pollution of the streams and the universal pestilence of weeds and refuse in our thickly populated districts.

I cannot refrain from quoting an amusing poem of James Whitcomb Riley's, which expresses (more completely than anything I know) the delight of boys in out-door life, where so many things happen and so many things lure; and you can easily catch in the swing of Riley's verse that wanton note which is ordinarily so fascinatingly boyish, but which may too easily turn to a raging indifference to everything that makes for purity in this troubled life of ours.

### THREE JOLLY HUNTERS.

O there were three jolly youngsters;  
And a-hunting they did go,  
With a setter-dog and a pointer-dog  
And a yaller-dog also.  
Looky there!

And they hunted and they hal-looed;  
And the first thing they did find  
Was a dingling-dangling hornets' nest  
A-swinging in the wind.  
Looky there!

And the first one said, "What is it?"

Said the next, "Let's punch and see,"

And the third one said, a mile from there,

"I wish we'd let it be!"

Looky there! (Showing the back of his neck.)

And they hunted and they hal-looed;

And the next thing they did raise

Was a bobbin bunnie cotton-tail

That vanished from their gaze.

Looky there!

One said it was a hot baseball,

Zippt thru the brambly thatch,

But the others said 'twas a note by post

Or a telergraph dispatch.

Looky there!

So they hunted and they hal-looed;

And the next thing they did sight,

Was a great big bull-dog chasing them,

And a farmer hollering "Skite!"

Looky there!

And the first one said "Hi-jinktum!"

And the next, "Hi-jinktum-jee!"

And the last one said, "Them very words

Has just occurred to me!"

Looky there! (Showing the tattered seat of his pants.)

This is the hunting song of the American Ban-

der-log,\* and this kind of hunting is better than the kind that needs a gun. To one who falls

\* ROAD-SONG OF THE BANDER-LOG.

(From Kipling's Jungle-Book.)

Here we go in a flung festoon,  
Half way up to the jealous moon!  
Don't you envy our pranceful bands?  
Don't you wish your feet were hands?  
Wouldn't you like if your tails were—so—  
Curved in the shape of a cupid's bow?  
Now you're angry, but—never mind—  
Brother, thy tail hangs down behind!

Here we sit in a branchy row,  
Thinking of beautiful things we know;  
Dreaming of deeds we mean to do,  
All complete in a minute or two—  
Something noble and grand and good,  
Done by merely wishing we could.  
Now we're going to—never mind—  
Brother, thy tail hangs down behind!

All the talk we ever have heard  
Uttered by bat, or beast, or bird—  
Hide or scale or skin or feather—  
Jabber it quickly and altogether!  
Excellent! Wonderful! Once again!  
Now we are talking just like men.  
Let's pretend we are—never mind—  
Brother, thy tail hangs down behind!  
This is the way of the Monkey-kind.

Then join our leaping lines that scumfish through the pines,  
That rocket by where light and high the wild grape swings.  
By the rubbish in our wake, by the noble noise we make,  
Be sure, be sure, we're going to do some splendid things.



into the habit of it, the gun is indeed a useless tool. I am reminded of a day I spent with a gun at a remote place in the Rocky Mountains, where, during the 25 days I have camped there on four different trips, I have seen as many as 150 of the wildest of North American animals, the Rocky Mountain sheep. I lay in ambush for three hours waiting for sheep, and the sheep came; but they were out of range again before I saw them because I had become so interested in killing mosquitoes! I timed myself at intervals, and 80 per minute for three solid hours makes an honest estimate of 14,400. And I was hungry, too. I fancy the sheep were not frightened but wished the good work to go on undisturbed.

Do you, perhaps, like candy? Did you ever consider that the only sweetmeat our forefathers had for thousands of years was wild honey? And those sour times—if I may call them such—before the days of sugar and candy, come much nearer to us than you realize, for I can remember my own grandfather's tales of bee-hunting in Tennessee. Just imagine how exciting it must have been in the days of long-ago to find a tree loaded with—candy! A bee tree! If Bill were to go back with me to the wild

woods of Tennessee, some thrill of that old excitement would well up from the depths of his soul at finding such a tree. You may wonder what I am driving at, so I will tell you, that one of the most exciting experiences of my boyhood was a battle with a colony of bumble bees. I was led into it by an older companion and the ardor and excitement of that battle, as I even now remember it, are wholly inexplicable to me except I think of it as a representation through inherited instinct of a ten-thousand-years' search for wild honey.

My schooling grew out of instinctive reactions toward natural things; hunting and fishing, digging and planting in the Spring, nutting in the Fall, and the thousands of variations which these things involve, and I believe that the play of instinct is the only solid basis of growth of a boy or girl. I believe, furthermore, that the very essence of boy humor is bound up with the amazing incongruity of his instincts. Was there ever a boy whose instincts (many of them mere fatuity like his digestive appendix) have not led him time and again into just thin air, to say nothing of water and mud! For my part I have never known anything more supremely funny than learning what a hopeless mess of wood pulp and

worms a bumble-bee's nest really is, except, perhaps, seeing another boy learn the same stinging lesson.

The use of formulas, too, is unquestionably instinctive, and we all know how apt a boy is to indulge in formulas of the hocus-pocus sort, like Tom Sawyer's recipe for removing warts by the combined charm of black midnight and a black cat, dead. And a boy arrives only late in his boyhood, if ever, to some sense of the distinction between formulas of this kind and such as are vital and rational. I think that there is much instruction and a great deal of humor connected with the play of this instinctive tendency. I remember a great big boy, a hired man on my grandfather's farm, in fact, who was led into a fight with a nest of hornets with the expectation that he would bear a charmed skin if he shouted in loud repetition the words, "Jew's-harp, jew's-harp."

Talk about catching birds by putting salt on their tails! Once, as I rowed around a bend on a small stream, I saw a sand-hill crane stalking along the shore. Into the water I went with the suddenly conceived idea that I could catch that crane, and, swimming low, I reached the shore, about 20 feet from the bird, jumped quickly out

of the water, made a sudden dash and the bird was captured! Once I saw a catfish, gasping for air at the surface of water that had been muddied by the opening of a sluice-way in a dam. Swimming up behind the fish, I jammed a hand into each gill, and, helped by the fish's tail, I pushed it ashore; and it weighed 36 pounds! A friend of mine, by the name of Stebbins, once followed his dog in a chase after a jack rabbit. The rabbit made a wide circle and came back to its own trail some distance ahead of the dog, then it made a big sidewise jump, and sat looking at the dog as it passed by; so intently indeed that Stebbins walked up behind the rabbit and took it up with his hands.

I think you will agree with me that my outdoor school was a wonderful thing. The Land of Out-of-Doors! To young people the best school and play-house, and to older people an endless asylum of delight.

“ The grass so little has to do,  
A sphere of simple green  
With only butterflies to brood  
And bees to entertain.

“ And stir all day to pretty tunes  
The breezes fetch along,  
And hold the sunshine in its lap  
And bow—to everything.

“ And thread the dew all night, like pearls,  
And make itself so fine,  
A duchess were too common  
For such a noticing.

“ And even when it dies, to pass  
In odors so divine  
As lowly spices gone to sleep,  
Or amulets of pine.

“ And then to dwell in sovereign barns  
And dream the days away,  
The grass so little has to do—  
I wish I were the hay.”

---

The most important thing, I should say, for the success of Bill's fine school is that ample opportunity be given to Bill for every variety of play including swimming and skating, and wherever possible, boating. It is ridiculous to attempt to teach Bill anything without the substantial results of play to build upon. Playgrounds are the cheapest and, in many respects, the best of schools, but they are almost entirely lacking in many of our towns which have grown to cities in a generation in this great nation of villagers. The Boroughs of the Bethlehems, for example, have no playground connected with

a Public School, nor any other public place where boys can play ball.

### WHAT DO YOU THINK?

(This and the following communication are from a small paper, printed and published by two Bethlehem boys.)

We, the editors, have been dragged along back alleys, across open sewers, and through rank growths of weed and thistle to view the Monocacy meadows to consider the possibility of their use as a playground or park. We are not much impressed with the proposal, the place is apparently hopeless, but the park enthusiast could not be touched by argument. To our very practical objection that the cost would be excessive, he made the foolish reply that there is no cost but a saving in using what has hitherto been wasted. To our expressed disgust for the open sewers and filth he replied that that was beside the question, for, as he said, we must sooner or later take care of the filth anyway. But, we said, the creek is contaminated above the town. Very well, he replied, we have the right the prohibit such contamination. But worst of all, in double meaning, was his instant agreement to our statement that we had our cemeteries which, he said, were really better than any Bethlehem park could be.

### COMMUNICATION.

*Dear Editors:* I took a walk along the Monocacy Creek on Sunday afternoon and discovered clear water several miles above town and a fine skating pond; but I suppose that you and all of your subscribers will have to go to our enterprising neighbor, Allentown, to find any well-kept ice to skate on

this Winter. Most people think that you boys can swim in Nature's own water, skate on Nature's own ice, and roam in Nature's own woods, but it is absolutely certain that your elders must take some care and pains if you town boys are to do any of these things. And yet, here in the East, children are said to be brought up (implying care and pains) and hogs are said to be raised (implying only feeding). I thank the Lord that I was "raised" in the West where there are no such false distinctions.

Your subscriber, S.

P. S.—As I came home covered with beggar-lice and cockle-burrs I saw a ring of fire on South Mountain, an annual occurrence which has been delayed a whole week this Autumn by a flourish of posters in several languages offering One Hundred Dollars Reward!

S.

In these days of steam and electricity we boast of having conquered nature. Well, we have got to domesticate nature before much else can be accomplished in this country of ours. We have got to take care of our brooks and our rivers, of our open lands and our wooded hills. We have got to do it, and Bill would be better off if we took half of the cost of his fine school to meet the expense of doing it. When I was a boy I belonged to the Bander-log, but Bill belongs to another tribe, the Rats, and there is nothing I would like so much to do as to turn Pied Piper and lure the entire brood of Bethlehem boys and

girls to Friedensville\* and into that awful chasm of crystal water to come back no more, no, not even when an awakened civic consciousness had made a park of the beautiful Monocacy meadows and converted the creek into a chain, a regular Diamond Necklace of swimming holes. I beg the garbage men's (not a printer's error for man's) pardon for speaking of the beautiful Monocacy meadows. I refer to what has been and to what might easily continue to be. As for the Diamond Necklace, that, of course, would have to be above our gas works where the small stream of pure tar now joins the main stream.

I know a small river in Kansas which is bordered by rich bottom lands from one-half to one mile in width between beautifully scalloped bluffs—where the upland prairie ends. In early days thick covering of grass was everywhere, and the clear stream, teeming with life, wound its way along a deep channel among scattered clusters of large walnut trees and dense groves of elm and cotton wood, rippling here and there over beds of rock. Now, however, every foot of ground, high and low, is mellowed by the plow, and the last time I saw the once beautiful valley of Wolf River it was as if the whole earth

\* The site of an abandoned zinc mine, where a few of the Bethlehem boys go to swim.



had melted with the rains of June, such devastation of mud was there! Surely it requires more than the plow to domesticate nature; indeed, since I have lived between the coal-bearing Alleghenies and the sea, I have come to believe that it may require more than the plow and the crowded iron furnace, such pestilence of refuse and filth is here!

I suppose that I am as familiar with the requirements of modern industry as any man living, and as ready to tolerate everything that is economically wise, but every day as I walk to and fro I see our Monocacy Creek covered with a scum of tar, and in crossing the river bridge I see a half mile long heap of rotting refuse serving the Lehigh as a bank on the southern side; not all furnace refuse either by any means, but nameless stinking stuff cast off by an indifferent population and carelessly left in its very midst in one long unprecedented panorama of putrescent ugliness! And when, on splendid Autumn days, the nearby slopes of old South Mountain lift the eyes into pure oblivion of these distressing things, I see again and again a line of fire sweeping through the scanty woods. This I have seen every Autumn since first I came to Bethlehem.

It is easy to speak in amusing hyperbole of

garbage heaps and of brooks befouled with tar, but to have seen one useless flourish of posters on South Mountain in fifteen years! That is beyond any possible touch of humor. It is indeed unfortunate that our river is not fit for boys to swim in, and it is not, for I have tried it, and I am not fastidious either, having lived an amphibious boyhood on the banks of the muddiest river in the world; but it is a positive disgrace that our river is not fit to look at, that it is good for nothing whatever but to drink; much too good, one would think, for people who protect the only stretch of woodland that is accessible to their boys and girls by a mere flourish of posters!

I was born in Kansas when its inhabitants were largely Indians, and when its greatest resource was wild buffalo skins; and whatever objection you may have to this description of my present home-place between the coal-bearing Alleghenies and the sea, please do not imagine that I have a sophisticated sentimentality towards the Beauties of Nature! No, I am still enough of an Indian to think chiefly of my belly when I look at a stretch of country. In the West I like the suggestion of hog-and-hominy which spreads for miles and miles beneath the sky, and here in the East I like the promise of pillars of fire and smoke and I like the song of steam!

Bill's School and Mine! It may seem that I have said a great deal about my school, and very little about Bill's. But what is Bill's school? Surely, Bill's fine school-house and splendid teachers, and Bill's good mother are not all there is to Bill's school. No, Bill's school is as big as all Bethlehem, and in its bigger aspects it is a bad school, bad because Bill has no opportunity to play as a boy should play, and bad because Bill has no opportunity to work as a boy should work.

"I' b'en a-kindo musin', as the feller says, and I'm  
About o' the conclusion that they ain't no better time,  
When you come to cypher on it, than the times we used  
to know,  
When we swore our first 'dog-gone-it' sorto solem'-like  
and low.

"You git my idy, do you?—LITTLE tads, you understand—  
Jes' a wishin', thue and thue you, that you on'y was a MAN.  
Yet here I am this minute, even forty, to a day,  
And fergittin' all that's in it, wishin' jes the other way!"

I wonder if our Bill will "wish the other way" when he is a man? Indeed, I wonder if he will ever BE a man. If we could only count on that, Bill's school would not be our problem.



PLAY AS A TRAINING IN  
APPLICATION.

Never yet was a boy who dreamed  
of ice-cream sundaes while  
playing ball.

Every one knows that play means health and happiness to children, and nearly every one thinks of the playgrounds movement as based solely on ideals of health and ideals of happiness in a rather narrow sense; but the movement means much more than health and happiness as these terms are generally understood. Play is itself the most fundamental and perhaps the most important form of education.

The Indian boy's play, which included practice with the bow and arrow, foot racing, ball playing and horse-back riding, was perfectly adapted to the needs of his adult life, but how about base ball and prisoner's base for the boy who is to become a salesman or a mechanic, a physician or an engineer? Good fun and a good appetite certainly come from these games, and one may also place to their credit a tempered reasonableness and a high regard for what is fair and square; but as a training in intense and eager application, nothing can take their place.

Play as a training in application! that certainly is a paradox; and yet everyone knows that play is the first thing in life to give rise to that peculiar overwhelming eagerness which alone

can bring every atom of one's strength into action. Ability to focus one's whole mind upon an undertaking and to apply one's whole body in concentrated effort is what our boys and girls are most in need of, and vigorous competitive play serves better than anything else, if, indeed there is anything else to create it.

Intense and eager application! That means not only an escape from laziness and apathy, but eagerness is the only thing in the world that defies fatigue. A healthy boy can put forth an amazing amount of physical effort and be fresh at the end of a day of play. And a man whose habit of application is so highly developed that it assumes a quality of eagerness and never fails in absolute singleness of purpose, is there any limit to what such a man can do?



# THE ENERGIZING OF PLAY.

Strenuous play leads to strenuous work.

Scarcely more than a generation ago every American boy came under the spell of hunting and fishing, the most powerful incitement to laborious days and the most potent of all antidotes for bodily discomfort and hardship; and the problem of educational play is to a great extent the problem of finding a substitute for the lure of the wild for the energizing of play.

The lure of the wild! Alas it is but a poet's fancy in this tame world of ours! A tame world indeed; but it is peopled by a perennial race of Wild Indians, our children. Fortunately, however, they are not dependent upon completely truthful externals. They do not need a million square miles of wild buffalo country; no, they will chase an imaginary stag 'round a vacant lot all day, if only there is a mixture of earth and sky and greenery to set off their make believe—and eat mush and milk when the day is done!

But even youngsters must hunt in packs. Indeed the gang-idea contains the ultimate solution of what would otherwise be an impossible problem, namely, to find an efficient substitute for the lure of the wild for the energizing of play. And play must be energized; the kind of play

that educates; the kind that approaches hunting or fishing or tribal warfare or the settling of a blood-feud in its all-absorbing, single-minded, strenuous activity.

It is silly for contented towns-folk to say "let the children play," because city children do not play by merely being allowed to do so. They may indeed fight or steal, or sit by a fire in a back alley talking sex like grown-up sordidly-imaginative Hottentots in Darkest Africa; but the make-believe of natural play demands flowing brooks and woodland-hills—or a little suggestive example and organization with facilities for the kind of play that means individual and gang competition.

# THE STUDY OF SCIENCE.

Grau theurer Freund ist alle Theorie  
Und grün des Lebens goldener Baum.

GOETHE.

Everyone realizes the constraint that is placed upon the lives of men by the physical necessities of the world in which we live, and although in one way this constraint is more and more relieved with the progress of the applied sciences, in another way it becomes more and more exacting. It is indeed easier to cross the Atlantic Ocean now than it was in Leif Ericsson's time, but consider the discipline of the shop, and above all consider the rules of machine design! Could even the hardy Norsemen have known anything as uncompromisingly exacting as these? To do things becomes easier and easier, but to learn how to do things becomes more and more difficult.

Every person I have ever talked with, old or young, theorist or practitioner, student-in-general or specialist in whatever line, has exhibited more or less distinctly a certain attitude of impatience towards the exactions of this or that phase of the precise modes of thought of the physical sciences.

“Da wird der Geist Euch wohl dressiert  
In spanische Stiefeln eingeschnuert.”

In a recent article\* on the distinction between the liberal and technical in education, my friend and colleague, Professor Percy Hughes, says that in speaking of an education as liberal we thereby associate it with liberalism in politics, in philosophy and theology, and in men's personal relations with each other. In each case liberalism seems fundamentally, to denote freedom, and liberalism in education is the freedom of development in each individual of that character and personality which is his true nature. All this I accept in the spirit of an optimist, assuming men's true natures to be good, but I do not, and I am sure that Professor Hughes does not, consider that technical education, unless it be inexcusably harsh and narrow, is illiberal; nor that liberal education, unless it be inexcusably soft and vague, is wholly non-technical. The liberal and the technical are not two kinds of education, each complete in itself. Indeed, Professor Hughes speaks of liberal education, not as a category, but as a condition which makes for freedom of development of personality and character.

It seems to me, however, that there are phases of education which have but little to do with

\* *Popular Science Monthly*, October, 1910.



personality, and I call to your attention this definition of liberalism in education, in order that I may turn sharply away from it as a partial definition which, to a great extent, excludes the physical sciences. Indeed, I wish to speak of a condition in education which is the antithesis of freedom. I wish to explain the teaching of elementary physical science as a mode of constraint, as an impressed constructive discipline without which no freedom is possible in our dealings with physical things. I wish to characterize the study of elementary physical science as a reorganization of the workaday mind of a young man as complete as the pupation of an insect; and I wish to emphasize the necessity of exacting constraint as the essential condition of this reorganization.

There is a kind of salamander, the axolotl, which lives a tad-pole like youth and never changes to the adult form unless a stress of dry weather annihilates his watery world; but he lives always and reproduces his kind as a tad-pole, and a very funny-looking tadpole he is, with his lungs hanging like feathery tassels from the sides of his head. When the aquatic home of the axolotl dries up, he quickly develops a pair of internal lungs, lops off his tassels and

embarks on a new mode of life on land. So it is with our young men who are to develop beyond the tadpole stage, they must meet with quick and responsive inward growth that new and increasing "stress of dryness," as many are wont to call our modern age of science and organized industry.

Stress of dryness! Indeed no flow of humor is to be found in the detached impersonalities of the sciences, and if we are to understand the characteristics of physical science we must turn our attention to things which lead inevitably to an exacting and rigid mathematical philosophy. It certainly is presumptive to tell a reader that he must turn his attention to such a thing, but there is no other way; the best we can do is to choose the simplest path. Let us therefore consider the familiar phenomena of motion.

The most prominent aspect of all phenomena is motion. In that realm of nature which is not of man's devising\* motion is universal. In the

\* Science as young people study it has two chief aspects, or in other words, it may be roughly divided into two parts, namely, the study of *the things which come upon us*, as it were, and the study of *the things which we deliberately devise*. The things that come upon us include weather phenomena and every aspect and phase of the natural world, the things we cannot escape; and the things we devise relate chiefly to the serious work of the world, the things we laboriously build and the things we deliberately and patiently seek.

other realm of nature, the realm of things devised, motion is no less prominent. Every purpose of our practical life is accomplished by movements of the body and by directed movements of tools and mechanisms, such as the swing of scythe and flail, and the studied movements of planer and lathe from which are evolved the strong-armed steam shovel and the deft-fingered loom.

The laws of motion. Every one has a sense of the absurdity of the idea of reducing the more complicated phenomena of nature to an orderly system of mechanical law. To speak of motion is to call to mind first of all the phenomena that are associated with the excessively complicated, incessantly changing, turbulent and tumbling motion of wind and water. These phenomena have always had the most insistent appeal to us, they have confronted us everywhere and always, and life is an unending contest with their fortuitous diversity, which rises only too often to irresistible sweeps of destruction in fire and flood, and in irresistible crash of collision and collapse where all things mingle in one dread fluid confusion! The laws of motion! Consider the awful complexity of a disastrous tornado or the dreadful confusion of a railway

wreck, and understand that what we call the laws of motion, although they have a great deal to do with the ways in which we think, have very little to do with the phenomena of nature. The laws of motion! There is indeed a touch of arrogance in such a phrase with its unwarranted suggestion of completeness and universality, and yet the ideas which constitute the laws of motion have an almost unlimited extent of legitimate range, *and these ideas must be possessed with a perfect precision if one is to acquire any solid knowledge whatever of the phenomena of motion.* The necessity of precise ideas. Herein lies the impossibility of compromise and the necessity of coercion and constraint; one must think so and so, there is no other way. And yet there is always a conflict in the mind of even the most willing student because of the constraint which precise ideas place upon our vivid and primitively adequate sense of physical things; and this conflict is perennial but it is by no means a one-sided conflict between mere crudity and refinement, for refinement ignores many things. Indeed, precise ideas not only help to form\* our sense of the world in which we live but they inhibit sense as well, and their rigid and un-

\* See discussion of Bacon's New Engine on page 52.

challenged rule would be indeed a stress of dryness.

The laws of motion. We return again and yet again to the subject, for one is not to be deterred therefrom by any concession of inadequacy, no, nor by any degree of respect for the vivid youthful sense of those things which to suit our narrow purpose must be stripped completely bare. It is unfortunate, however, that the most familiar type of motion, the flowing of water or the blowing of the wind, is bewilderingly useless as a basis for the establishment of the simple and precise ideas which are called the "laws of motion," and which are the most important of the fundamental principles of physics. These ideas have in fact grown out of the study of the simple phenomena which are associated with the motion of bodies in bulk without perceptible change of form, the motion of rigid bodies, so called.

Before narrowing down the scope of the discussion, however, let us illustrate a very general application of the simplest idea of motion, the idea of velocity. Every one has, no doubt, an idea of what is meant by the velocity of the wind; and a sailor, having what he calls a ten-knot wind, knows that he can manage his boat with a

certain spread of canvas and that he can accomplish a certain portion of his voyage in a given time; but an experienced sailor, although he speaks glibly of a ten-knot wind, belies his speech by taking wise precaution against every conceivable emergency. He knows that a ten-knot wind is by no means a sure or a simple thing with its incessant blasts and whirls; and a sensitive anemometer, having more regard for minutiae than any sailor, usually registers in every wind a number of almost complete but excessively irregular stops and starts every minute and variations of direction that sweep around half the horizon!

Wer will was Lebendig's erkennen und beschreiben  
Sucht erst den Geist heraus zu treiben.

GOETHE.

We must evidently direct our attention to something simpler than the wind. Let us, therefore, consider the drawing of a wagon or the propulsion of a boat. It is a familiar experience that effort is required to start a body moving and that continued effort is required to maintain the motion. Certain very simple facts as to the nature and effects of this effort were discovered

by Sir Isaac Newton, and on the basis of these facts Newton formulated the laws of motion.

The effort required to start a body or to keep it moving is called force. Thus, if one starts a box sliding along a table one is said to exert a force on the box. The same effect might be accomplished by interposing a stick between the hand and the box, in which case one would exert a force on the stick and the stick in its turn would exert a force on the box. We thus arrive at the notion of force action between inanimate bodies, between the stick and the box in this case, and Newton pointed out that the force action between the two bodies *A* and *B* always consists of two equal and opposite forces, that is to say, if body *A* exerts a force on *B*, then *B* exerts an equal and opposite force on *A*, or, to use Newton's words, action is equal to reaction and in a contrary direction.

In leading up to this statement one might consider the force with which a person pushes on the box and the equal and opposite force with which the box pushes back on the person, but if one does not wish to introduce the stick as an intermediary, it is better to speak of the force with which the hand pushes on the box, and the equal and opposite force with which the box pushes back on the hand, because in discussing physical phenomena it is of the utmost importance to pay attention only to impersonal

things. Indeed our modern industrial life, in bringing men face to face with an entirely unprecedented array of intricate mechanical and physical problems, demands of every one a great and increasing amount of impersonal thinking, and the precise and rigorous modes of thought of the physical sciences are being forced upon widening circles of men with a relentless insistence—all of which it was intended to imply by referring to the “stress of dryness” which overtakes the little axolotl in his contented existence as a tadpole.

When we examine into the conditions under which a body starts to move and the conditions under which a body once started is kept in motion, we come across a very remarkable fact, if we are careful to consider every force which acts upon the body, and this remarkable fact is that the forces which act upon *a body at rest* are related to each other in precisely the same way as the forces which act upon *a body moving steadily along a straight path*. Therefore it is convenient to consider, *first* the relation between the forces which act upon a body at rest, or upon a body in uniform motion, and *second* the relation between the forces which act upon a body which is starting or stopping or changing the direction of its motion.

Suppose a person *A* were to hold a box in mid-air. To do so it would of course be necessary for him to push upwards on the box so as to balance the downward pull



of the earth, the weight of the box as it is called. If another person *B* were to take hold of the box and pull upon it in any direction, *A* would have to exert an equal pull on the box in the opposite direction to keep it stationary. *The forces which act upon a stationary body are always balanced.*

Every one, perhaps, realizes that what is here said about the balanced relation of the forces which act upon a stationary box, is equally true of the forces which act on a box similarly held in a steadily moving railway car or boat. Therefore, *the forces which act upon a body which moves steadily along a straight path are balanced.*

This is evidently true when the moving body is surrounded on all sides by things which are moving along with it, as in a car or a boat; but how about a body which moves steadily along a straight path but which is surrounded by bodies which do not move along with it? Everyone knows that some active agent such as a horse or a steam engine must pull steadily upon such a body to keep it in motion. If left to itself such a moving body quickly comes to rest. Many have, no doubt, reached this further inference from experience, namely, that the tendency of moving bodies to come to rest is due to the dragging forces, or friction, with which surrounding bodies act upon a body in motion. Thus a moving boat is brought to rest by the drag of the water when the propelling force ceases to act; a train of cars is brought to rest because of the drag due to friction when the pull of the locomotive ceases; a box which is moving across a table comes to rest when left to itself, because of the drag due to friction between the box and the table.

We must, therefore, always consider two distinct forces when we are concerned with a body which is kept in motion, namely, the *propelling force* due to some active agent such as a horse or an engine, and the *dragging force* due to surrounding bodies. Newton pointed out that when a body is moving steadily along a straight path, the propelling force is always equal and opposite to the dragging force. Therefore, *The forces which act upon a body which is stationary, or which is moving uniformly along a straight path, are balanced forces.*

Many hesitate to accept as a fact the complete and exact balance of propelling and dragging forces on a body which is moving steadily along a straight path in the open, but direct experiment shows it to be true, and the most elaborate calculations and inferences based upon this idea of the complete balance of propelling and dragging forces on a body in uniform motion are verified by experiment. One may ask, why a canal boat, for example, should continue to move if the pull of the mule does not exceed the drag of the water; but why should it stop if the drag does not exceed the pull? Understand that we are not considering the starting of the boat. The fact is that the conscious effort which one must exert to drive a mule, the cost of the mule, and the expense of his keep, are what most people think of, however hard one tries to direct their attention solely to the state of tension in the rope that hitches the mule to the boat after the boat is in full motion; and most people consider that if the function of the mule is simply to balance the drag of the water so as

to keep the boat from stopping, then why should there not be some way to avoid the cost of so insignificant an operation? There is, indeed, an extremely important matter involved here, but it has no bearing on the question as to the balance of propulsion and drag on a body which moves steadily along a straight path.

Let us now consider the relation between the forces which act upon a body which is changing its speed, upon a body which is being started or stopped, for example. Everyone has noticed how a mule strains at his rope when starting a canal boat, especially if the boat is heavily loaded, and how the boat continues to move for a long time after the mule ceases to pull. In the first case, the pull of the mule greatly exceeds the drag of the water, and the speed of the boat increases; in the second case, the drag of the water of course exceeds the pull of the mule, for the mule is not pulling at all, and the speed of the boat decreases. When the speed of a body is changing, the forces which act on the body are unbalanced. We may conclude therefore that *the effect of an unbalanced force acting on a body is to change the velocity of the body*, and it is evident that the longer the unbalanced force continues to act the greater the change of velocity. Thus if the mule ceases to pull on a canal boat for one second the velocity of the boat will be but slightly reduced by the unbalanced drag of the water, whereas if the mule ceases to pull for two seconds the decrease of velocity will be much greater. *In fact the change of velocity due to a given unbalanced force is proportional to the time that the force continues to act.* This is exemplified by a

body falling under the action of the unbalanced pull of the earth; after one second it will have gained a certain amount of velocity (about 32 feet per second), after two seconds it will have made a total gain of twice as much velocity (about 64 feet per second), and so on.

Since the velocity produced by an unbalanced force is proportional to the time that the force continues to act, it is evident that the effect of the force should be specified as so-much-velocity-produced-per-second, exactly as in the case of earning money, the amount one earns is proportional to the length of time that one continues to work, and we always specify one's earning capacity as so-much-money-earned-per-day.

Everyone knows what it means to give an easy pull or a hard pull on a body. That is to say, we all have the ideas of greater and less as applied to forces. Everybody knows also that if a mule pulls hard on a canal boat, the boat will get under way more quickly than if the pull is easy, that is, the boat will gain more velocity per unit of time under the action of a hard pull than under the action of an easy pull. Therefore, any precise statement of the effect of an unbalanced force on a given body must correlate the precise value of the force and the exact amount of velocity produced per unit of time by the force. This seems a very difficult thing, but its apparent difficulty is very largely due to the fact that we have not as yet agreed as to what we are to understand by the statement that one force is precisely three, or four, or any number of times as great as another. Suppose, therefore, that *we agree to call one force twice as large as another when it will*

*produce in a given body twice as much velocity in a given time* (remembering of course that we are now talking about unbalanced forces, or that we are assuming for the sake of simplicity of statement, that no dragging forces exist). As a result of this definition we may state that *the amount of velocity produced per second in a given body by an unbalanced force is proportional to the force.*

Of course we know no more about the matter in hand than we did before we adopted the definition, but we do have a good illustration of how important a part is played in the study of physical science, by what we may call making up one's mind, in the sense of putting one's mind in order. This kind of thing is very prominent in the study of elementary physics, and the rather indefinite reference (in the story of the little tasseled tadpole) to an inward growth as needful before one can hope for any measure of success in our modern world of scientific industry was an allusion to this thing, the "making-up" of one's mind. Nothing is so essential in the acquirement of exact and solid knowledge as the possession of precise ideas, not indeed that a perfect precision is necessary as a means for retaining knowledge, *but that nothing else so*

*effectually opens the mind for the perception even of the simplest evidences of a subject.\**

We have now settled the question as to the effect of different unbalanced forces on a given body on the basis of very general experience, and by an agreement as to the precise meaning to be attached to the statement that one force is so many times as great as another; but how about the effect of the same force upon different bodies, and how may we identify the force so as to be sure that it is the same? It is required, for example, to exert a given force on body  $A$  and then exert the same force on another body  $B$ . This can be done by causing a third body  $C$  (a coiled spring, for example) to exert the force; then the forces exerted on  $A$  and  $B$  are the same if the reaction in each case produces the same effect on body  $C$  (the same degree of stretch, for example). Concerning the effects of the same unbalanced force on different bodies three things have to be settled by experiment as follows:

(a) In the first place let us suppose that a certain force  $F$  is twice as large as a certain other force  $G$ , according to our agreement, because the force  $F$  produces twice as much velocity every second as force  $G$  when the one and then the other of these forces is caused to act upon a given body, a piece of lead for example. Then, does the force  $F$  produce twice as much velocity

\* Opens the mind, that is, for those things which are conformable to or consistent with the ideas. The history of science presents many cases where accepted ideas have closed the mind to contrary evidences for many generations. Let young men beware!

every second as the force  $G$  whatever the nature and size of the given body, whether it be wood, or ice, or sugar? Experiment shows that it does.

(b) In the second place, suppose that we have such amounts of lead, or iron, or wood, etc., that a certain given force produces the same amount of velocity per second when it is made to act, as an unbalanced force, upon one or another of these various bodies. Then what is the relation between the amounts of these various substances? Experiment shows that they all have the same mass in grams, or pounds, as determined by a balance. That is, a given force produces the same amount of velocity per second in a given number of grams of any kind of substance. Thus the earth pulls with a certain definite force (in a given locality) upon  $M$  grams of any substance and, aside from the dragging forces due to air friction, all kinds of bodies gain the same amount of velocity per second when they fall under action of the unbalanced pull of the earth.

(c) In the third place, what is the relation between the velocity per second produced by a given force and the mass in grams (or pounds) of the body upon which it acts. Experiment shows that *the velocity per second produced by a given force is inversely proportional to the mass of the body upon which the force acts*. In speaking of the mass of the body in grams (or pounds) we here refer to the result which is obtained by weighing the body on a balance scale, and the experimental fact which is here referred to constitutes a very important discovery: namely, when one body has twice the mass of another, according to the balance method of measur-

ing mass, it is accelerated half as fast by a given unbalanced force.

The effect of an unbalanced force in producing velocity may therefore be summed up as follows: *The velocity per second produced by an unbalanced force is proportional to the force and inversely proportional to the mass of the body upon which the force acts, and the velocity produced by an unbalanced force is always in the direction of the force.*

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“We advise all men,” says Bacon, “to think of the true ends of knowledge, and that they endeavor not after it for curiosity, contention, or the sake of despising others, nor yet for reputation or power or any other such inferior consideration, but solely for the occasions and uses of life.” It is difficult to imagine any other basis upon which the study of physics can be justified than for the occasions and uses of life; in a certain broad sense, indeed, there is no other justification. But the great majority of men must needs be practical in the narrow sense, and physics, as the great majority of men study it, relates chiefly to the conditions which have been elaborated through the devices of industry as exemplified in our mills and factories, in our machinery of transportation, in optical and musical instruments, in the means for the supply



of power, heat, light, and water for general and domestic use, and so on.

From this narrow practical point of view it may seem that there can be nothing very exacting in the study of the physical sciences; but what is physics? That is the question. One definition at least is to be repudiated; it is not "The science of masses, molecules and the ether." Bodies have mass and railways have length, and to speak of physics as the *science of masses* is as silly as to define railroading as the *practice of lengths*, and nothing as reasonable as this can be said in favor of the conception of physics as the science of molecules and the ether; it is the sickliest possible notion of physics, whereas the healthiest notion, even if a student does not wholly grasp it, is that physics is the science of the ways of taking hold of things and pushing them!

Bacon long ago listed in his quaint way the things which seemed to him most needful for the advancement of learning. Among other things he mentioned "A New Engine or a Help to the mind corresponding to Tools for the hand," and the most remarkable aspect of present-day physical science is that aspect in which it constitutes a realization of this New Engine of

Bacon. We continually force upon the extremely meager data obtained directly through our senses, an interpretation which, in its complexity and penetration, would seem to be entirely incommensurate with the data themselves, and we exercise over physical things a kind of rational control which greatly transcends the native cunning of the hand. The possibility of this forced interpretation and of this rational control depends upon the use of two complexes: (a) A *logical structure*, that is to say, a body of mathematical and conceptual theory which is brought to bear upon the immediate materials of sense, and (b) a *mechanical structure*, that is to say, either (1) a carefully planned *arrangement of apparatus*, such as is always necessary in making physical measurements, or (2) a carefully planned *order of operations*, such as the successive operations of solution, reaction, precipitation, filtration, and weighing in chemistry.

These two complexes do indeed constitute a New Engine which helps the mind as tools help the hand; it is through the enrichment of the materials of sense by the operation of this New Engine that the elaborate interpretations of the physical sciences are made possible, and the study of elementary physics is intended to lead

to the realization of this New Engine: (a) By the building up in the mind, of the logical structure of the physical sciences; (b) by training in the making of measurements and in the performance of ordered operations, and (c) by exercises in the application of these things to the actual phenomena of physics and chemistry at every step and all of the time with every possible variation.

That, surely, is a sufficiently exacting program; and the only alternative is to place the student under the instruction of Jules Verne where he need not trouble himself about foundations but may follow his teacher pleasantly on a care-free trip to the moon or with easy improvidence embark on a voyage of twenty-thousand leagues under the sea.

What it means to study physical science may be explained further by mentioning the chief difficulties encountered in the teaching of that subject. One difficulty is that the native sense of most men is woefully inadequate without stimulation and direction for supplying the sense material upon which the logical structure of the science is intended to operate. A second difficulty is that the human mind is so in the habit of considering the practical affairs of life that it

can hardly be turned to that minute consideration of apparently insignificant details which is so necessary in the scientific analysis even of the most practical things. Everyone knows the capacity of the Indian for long continued and serious effort in his primitive mode of life, and yet it is difficult to persuade an Indian "farmer" to plow. Everyone knows also that the typical college student is not stupid, and yet it is difficult to persuade the young men of practical and business ideals in our colleges and technical schools to study the abstract elements of science. Indeed it is as difficult to get the average young man to hold abstract things in mind as to get a young Indian to plow, and for almost exactly the same reason. The scientific details of any problem are in themselves devoid of human value, and this quality of detachment is the most serious obstacle to young people in their study of the sciences.

A third difficulty which indeed runs through the entire front-of-progress of the human understanding is that the primitive mind stuff of a young man must be rehabilitated in entirely new relations in fitting the young man for the conditions of modern life. Every science teacher knows how much coercion is required for so little

of this rehabilitation; but the bare possibility of the process is a remarkable fact, and that it is possible to the extent of bringing a Newton or a Pasteur out of a hunting and fishing ancestry is indeed wonderful. Everyone is familiar with the life history of a butterfly, how it lives first as a caterpillar and then undergoes a complete transformation into a winged insect. It is, of course, evident that the bodily organs of a caterpillar are not at all suited to the needs of a butterfly, the very food (of those species which take food) being entirely different. As a matter of fact almost every portion of the bodily structure of the caterpillar is dissolved as it were, into a formless pulp at the beginning of the transformation, and the organization of a flying insect then grows out from a central nucleus very much as a chicken grows in the food-stuff of an egg. So it is in the development of a young man. In early childhood the individual, if he has been favored by fortune, exercises and develops more or less extensively the primitive instincts and modes of the race in a free out-door life, and the result is so much mind-stuff to be dissolved and transformed with more or less coercion and under more or less constraint into an effective mind of the twentieth-century type.

A fourth difficulty is that the possibility of the rehabilitation of mind-stuff has grown up as a human faculty almost solely on the basis of language, and the essence of this rehabilitation lies in the formation of ideas; whereas *a very large part of physical science is a correlation in mechanisms.*

The best way of meeting this quadruply difficult situation in the teaching of elementary physics is to relate the teaching as much as possible to the immediately practical and intimate things of life, and to go in for suggestiveness as the only way to avoid a total inhibition of the sense that is born with a young man. Such a method is certainly calculated to limber up our theories and put them all at work, the pragmatic method, our friends the philosophers call it, a method which pretends to a conquering destiny.

# THE DISCIPLINE OF WORK.

The first object of all work—not the principal one, but the first and necessary one—is to get food, clothes, lodging, and fuel.

But it is quite possible to have too much of all these things. I know a great many gentlemen, who eat too large dinners; a great many ladies, who have too many clothes. I know there is lodging to spare in London, for I have several houses there myself, which I can't let. And I know there is fuel to spare everywhere, since we get up steam to pound the roads with, while our men stand idle; or drink till they can't stand, idle, or otherwise.

RUSKIN.



Two generations ago school was supplemented by endless opportunity for play, and children had to work about the house and farm more and more as they grew to maturity. Play and work were in those days as plentiful as sunshine and air, and it is no wonder that educational ideals were developed taking no account of them. But we cling to these old ideals at the present time when children have no opportunity to play, when there is an almost complete absence of old fashioned chores about the home, when boys never see their fathers at work, and when the only opportunity for boys and girls to work outside the home is to face the certainty of reckless exploitation! What a piece of stupidity! Our entire educational system, primary and secondary, collegiate and technical, is sick with inconsequential bookishness, and school work has become the most inefficient of all the organized efforts of men.

Yes but we have our Manual Training Schools and out college courses in Shop Work and Shop Inspection. Away with such scholastic shams! The beginnings of manual training must indeed be provided for in school; paper cutting, sewing

and whittling. But from the absurdity of an Academic Epitome of Industry may the good Lord deliver us! And he will deliver us, never fear, for the law of economy is His law too. *The greatest educational problem of our time is to make use of commercial and industrial establishments as schools to the extent that they are schools.*

As a teacher the writer recognizes every year more and more the ineffectiveness of the study of the physical and mathematical sciences without the accompaniment of shop and factory work; and next to the direct support and outright control of higher education by the people, the most important thing is that the discipline of work come again to its own in our entire system of education.

*This book is dedicated to the kind of education that is proving itself at the University of Cincinnati.*

PART OF AN EDUCATION.

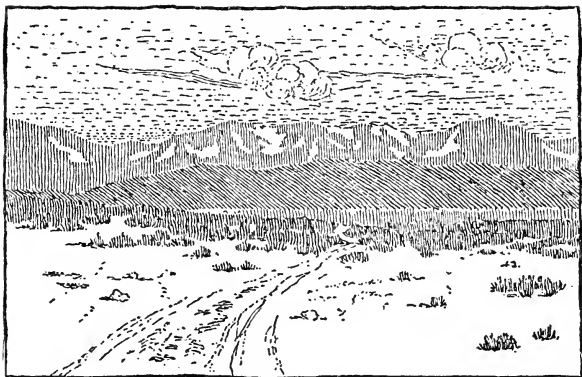
Prairie born ;

Once his feet touch the slope of Western mountain  
The level road they ever more shall spurn.  
If once he drink from snow-pure crystal fountain  
His thirst shall, ever more consuming, burn  
    With deepened draughts from common stream.

Once his eye catch glimpse of more substantial glory  
Than prairie horizon high piled with clouded foam  
His quickened yearning shall inspire old story  
Of unbounded, deathless realms beyond the sunset—Home!

There were two of us, a prairie-born tenderfoot in the person of a sixteen-year-old college sophomore and the writer. After months of anticipation and planning we hurried away at the close of the college term, leaving the prairies of Iowa to spend a short vacation in the mountains; and we arrived in Denver on a perfect, cloudless morning in June.

Since early daylight we had kept an eager watch to westward across the even plains to catch a first glimpse of the great Front Range of the Rocky Mountains with its covering of summer snow, and after making some purchases of camp supplies we climbed to Capitol Hill in Denver to see the foot-hills soften to purple and the snow fields melt to liquid gold as the crystal day turned to crimson glory with the setting of the sun.



“ This is the land that the sunset washes,  
Those are the Banks of the Yellow Sea  
Where it arose, and whither it rushes  
This is the western mystery.”

Late in the evening we took the train for Loveland from which place we were to start on a walking trip to Laramie, up in Wyoming.

In Loveland we purchased a pony and a pack-saddle. The pony had never been broken to the saddle, and inasmuch as the art of packing has always to be learned anew when one has not practiced it for several years, both of us were, in some respects, as green as the pony, and naturally somewhat nervous when we started from Loveland. The pony served us well however and at the worst only gave us a name for the Bucking Horse Pass when we crossed the range of the Medicine Bow Mountains from the waters of the Grand River to those of the North Platte.

From Loveland we reached Sprague's Ranch in Estes Park, thirty-five miles away, in two days of easy travel over a good stage road, encountering a snow squall in the high foot hills which left us cold and wet at sundown of the first day. In Estes Park we stayed three days, fishing, running up to timber line as preliminary exercise, and writing letters. The writer had spent two previous summers in Estes Park near Sprague's Ranch in company with friends from the University of Kansas.



CAMP ACCLIMATIZATION,  
June 21st.

*My dear little Friend:—*

D. and I reached this place day before yesterday. I saw Fred Sprague yesterday. He had already learned of our presence in the Park, having seen our characteristic hob-nail tracks, and, as his mother tells me, he remarked upon seeing them that "God's people had come," meaning the Kansas boys with whom he became acquainted in '86 and '89.

We have passed thousands of flowers since leaving Loveland, white poppies, cactus, blue bells, columbine and others more than I can tell. The blue bells are of the same kind that you and I found near Bloomington several weeks ago. It would be very nice if you and I could make some of our Saturday excursions in this country.

I wish I could tell you more of our trip. Of course it is scarcely begun as yet, but I know pretty well what it will be; hard, for one thing, and lonesome, but strangely fascinating. We are beginning already to have that attitude towards nature which I imagine Indians have, namely, the desire to get something to eat out of everything we see. [M. had written her brother D. at Moraine post office of the pies and cakes

they were making at home.] This is by no means greediness, for a measured appetite is essentially incompatible with the conditions of Indian life. In fact the only wild animals which are not gourmands on occasion are those which eat grass. Of course, we are at best only Agency Indians, but we shall soon be off our reservation.

Few people realize the utter desolation of many parts of the Rocky Mountains; and often on my mountain trips, hungry and foot-sore, my fancy has turned to what my friend 'Gric\* has told me of the utterly desolate Funeral Mountains that border Death Valley in southern California, and of the infinite sunshine there. What would *you* think, my little friend, even now amid the comforts and joys of home, if you could hear a trustworthy account of an actual trip over those dreadful Mountains and into that awful Valley?

I hope that the map with the accompanying description will help you to a knowledge of the geography and geology of this country. I send kind regards to your father and mother.

Your friend,

F.

\* See page 71.

Starting from Estes Park for the Grand River country we stopped over night at *Camp Desolation* in Windy Gulch, an enormous amphitheater rising above timber line on the north, east, and west, and opening to the south into Big Thompson Canyon. The mouth of the Gulch is dammed by the lateral moraine of an ancient Thompson glacier and behind this dam is a level, marshy stretch with a few green spruce and thickets of aspen, black alder and mountain willow. Near timber line also is a scattered fringe of green with dots of white. All the rest is a desolate stretch of burned timber.

Trailing to the head of Windy Gulch in the morning we gained the summit of Thompson Ridge which we followed in a northwesterly direction for about twelve miles; then we circled around the head of Big Thompson river and went down to Camp at the head of the Cache la Poudre river, precisely on the Continental Divide in Milner Pass about two hundred feet below timber line with Specimen Mountain immediately to the north of us.

SPECIMEN MOUNTAIN CAMP,  
June 24th.

*My Dear B:—*

D. and I are going to run down to Grand Lake settlement to-morrow for bacon and flour so I write this to-day. I have been in camp all morning cooking and mending while D. has been looking for sheep up in the crater of Specimen Mountain. He saw two and shot without effect. Specimen Mountain is an extinct volcano and sheep come to the crater to lick. I have seen as many as a hundred and fifty sheep there at different times during the four trips that I have made to this region, but I have hunted them only one day (the first) of the twenty-five that I have spent in this camp—without success, of course.

Flowers in profusion are found at these altitudes already where the shrinking snow drifts have exposed the ground to the warm June sun, but under the drifts it is yet the dead of winter. As the season advances the snow recedes, and each newly uncovered strip of ground passes with exuberant haste through a cycle of spring.

We came over from Estes Park yesterday and the day before. At one point I carried the horse's pack about a quarter of a mile on account of steepness of trail and depth of snow, leaving the pony under D's guidance to wallow through

as best she could. We shall, no doubt, have some hard work getting out of the Grand River valley to the north over the Medicine Bow but we intend to keep at it. We are, of course, likely to get cold and wet, tired and hungry. In fact, I am neither very dry nor very warm now as I write, for it is half snowing and half raining; nor hungry (?) for I have just eaten three slices of bacon, half a corn cake eight inches in diameter and an inch thick, with bacon gravy made with flour and water, and nearly a quart of strong coffee of syrupy sweetness. I do wish D. had killed that sheep this morning! We hope to get some trout to-morrow out of Grand River, but to see the sheets of water which are being shed off the range from rain and melting snow makes one feel uncertain of the trout fishing. I will close for this time and put this into my knapsack. To-morrow D. and I will get our "walkins" on bright and early, and pack it to Grand Lake. This is a tough country beyond imagination.

Yours sincerely,

F.

When trailing above timber line on our way to Specimen Mountain and subsequently we were on snow much of the time; below timber line at high altitudes we contended about equally with snow and fallen timber; and at middle altitudes where the timber is heavy and where fires have been frequent and disastrous the fallen timber alone is quite enough to make travel troublesome. Mud and water, fallen and falling, we encountered everywhere, but without much concern. The greatest vexation to the amateur traveler in the Rockies is to slip off a log in trying to cross a stream, and thus get wet all over, when if one had been reasonable, one might have been wet only to the middle. An awkward comrade of '89 did this so many times that it became a standing joke; but 'Gric, as we called him, that is to say *Agricola*, after his father "Farmer" Funston of Kansas, developed grit enough to take him through Death Valley in southern California, to take him, all alone, 1,600 miles down the Yukon River in an open boat and across 200 miles of unexplored country during the winter night to the shores of the Arctic Ocean, to take him into the Cuban army, where he received three serious wounds, and finally to take him through the Philippines

with our Volunteer Army where he captured Aguinaldo.

From *Specimen Mountain Camp* in Milner Pass we made our way to Grand River over an extremely difficult trail, nearly breaking our pony's leg in the fallen timber, and, finding it impossible to reach Grand Lake by the river trail without wetting our pack, we went into (*Mosquito*) camp and did our week's washing. The next day we left our pony, and made a flying round trip of thirty miles to the settlement. The next morning, hoping to escape the mosquitoes, we moved camp several miles up stream and in the afternoon we climbed to the summit of one of the high spurs of a nameless\* peak in the range of the Medicine Bow. We got back to camp late in the evening in a sharp rain, which continued all night.

The next morning promised fair weather, and after some hesitation, we packed up for the trip over to North Park. Starting at eight o'clock we reached the deserted mining camp, Lulu, at eleven, having forded Grand River seven times,

\* A volcanic mass of rugged spurs radiating from a great central core; points and ridges rising, beautifully red, from immense fields of snow. D. and the writer call it Mt. McDonald, but having made no survey, the purely sentimental report which we could send to the map makers in Washington would not suffice as a record there.

the water of it ice cold and swift as an arrow. We then began to climb the range, the summit of which we reached at three o'clock at the pass of the Bucking Horse far above timber line. At four o'clock we began the descent into the valley of the Michigan fork of the North Platte. The rain, until now fitful, became steady and we, determined to reach a good camping place, kept our pony at a half-trot until eight o'clock, when we found a deserted cabin. We were too impatiently hungry to make biscuit, which we ordinarily baked in the frying pan before cooking our bacon, so we made our supper of graham mush, bacon, bacon gravy and coffee. Next morning we found to our dismay that our baking powder had been left at the Bucking Horse—and no wonder, for our pack had been strewn for a quarter of a mile along the trail—so we were reduced to mush again for breakfast.

GOULD'S RANCH,  
July 7th.

*My Dear B:*

We have just returned from a week's hunt in the Medicine Bow Mountains east of here. We saw elk, killed a deer, and spent the Fourth of



July on a prominent but nameless peak from which we got a splendid view.

\* \* \* \* \*

After breakfast at Camp *Mush*, Mr. E. B. Gould, a neighboring cattle rancher who has no cattle, was attracted by the smoke of our camp-fire, and coming up to see us, he invited us to his shanty to eat venison. We went. We have now been with him a week and we are starting on our second carcass.

Gould lives by hunting and trapping, and by odd work in the Park during the haying season. He came to this country years ago with a hunting party and has been hunting ever since. Several years ago he took up a claim in the extreme southeastern corner of North Park conveniently near to hunting grounds in the Medicine Bow. He gave up his claim, for good, a year ago, and made an overland trip to New Mexico. That did not satisfy him either, so now he is back in his old shanty again. He thinks we are the toughest "tender-foots" he ever saw. He approves of us, there is no doubt about that, and he has pulled up his stakes to travel with us just for the pleasure of our company! He takes great interest in D's knowledge of bugs, and D. and he are both real hunters each

according to his experience. Before we fell in with Gould I could persuade D. to wanton exertion in the way of mountain climbing but now I am in the minority, but the hunters propose, with a flourish, the scaling of every peak that comes in sight.

I had a spell of mountain fever just before the Fourth and Gould dosed me with sage brush tea, the vilest concoction I ever had to take.

Gould is not accustomed to walk except when actually hunting, so he has a riding horse, and a trusty old pack animal whose minimum name is "G— d— you Jack," and whose maximum name (and load) is indeterminate. Gould is going with us to spend a week in the Range of the Rabbit's Ear, far to the west across North Park. He has an old wagon which, if it holds together, will save D. and me some tedious steps across the desert, for indeed this "park" is a desert. We shall pass through Walden, the metropolis and supply station of the Park.

Yours,

F.

FROM D'S MOTHER.

*My precious boy:*

I trust you will excuse me for using this paper but I am up stairs, and no one [is] here to bring

me any other. They tell me I need not wonder that we do not hear from you and I shall try not to be disappointed if we do not hear for a while. Nevertheless my dear boy, the uncertainty I feel in regard to your safety will make a letter very welcome indeed. Perhaps I would have more courage if I were strong. For five days I have been very uncomfortable. I am sitting up some today for the first [time] and hope soon to be well as usual.

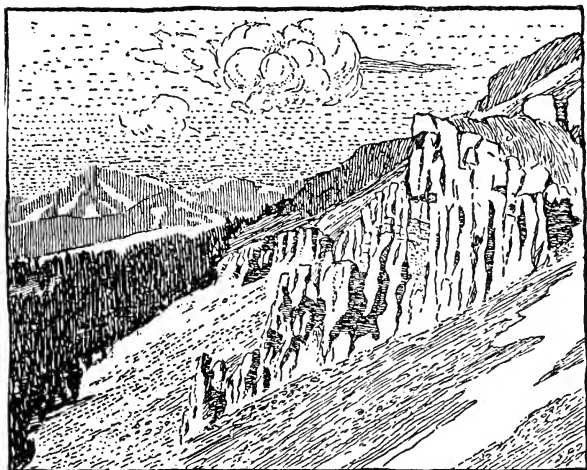
We were exceedingly glad to hear from you from Grand Lake. I cannot, however, say that the account of your experience by stone slide\* and river have lessened my anxiety. I am writing now, Thursday, in bed. I have been quite poorly again. We shall not look now for a letter from you but hope to see you face to face before many days. May God bless and keep you! Give our love to Mr. F. All join me in tenderest love to you.

Your devoted mother.

\*The crater of Specimen Mountain is worn away on one side by water, and the crater now forms the head of a ragged gulch. Near the head of this gulch is a slope of loose stone, as steep as loose stone can lie, which has a vertical height of 1500 or 2000 feet.

At Walden we laid in a fresh supply of flour and bacon, and canned goods, especially canned fruit, to last us while we stayed with the wagon. We then pushed on to the west, striking camp on the West Fork of the North Platte, where we stayed two nights. Here we tried hard a third time for trout without success, but we turned off the water from an irrigating ditch and captured a large number of "squaw fish" (suckers).

From *Camp Chew* we made our way well up into the foothills of the Range of the Rabbit's Ear, and then packed our animals, minimum Jack and our pony, and pushed up the range over the worst trail we had yet encountered, through an absolute wilderness of fallen timber. Rain with fog set in as we approached timber line, and we were forced to go into camp early to wait for morning. Morning came with fog and rain, and we spent the entire day hunting trail, only to go into camp again towards evening. The next day, however, came clear and we made our way over the range, through Frying Pan Meadow, and reached camp down on Elk river towards evening without difficulty. We found good fishing here at last and great numbers of deer but no elk. After three rainy days in *Elk River Camp*, one of which was spent jerking

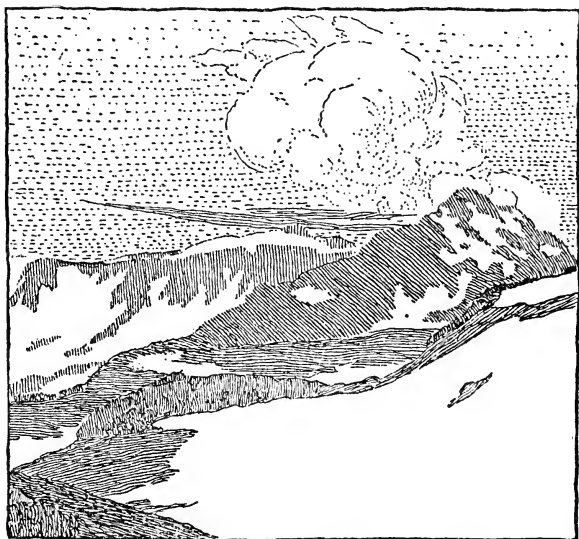


Looking North Across Specimen Mountain  
Stone Slide.

venison of D.'s killing, we packed up and made the return trip over the range in one day of hard travel, going into camp by the shore of a shallow pond well out on the barren level of North Park. The next morning we parted company with Gould, and in two days we made sixty stage road miles across North Park and over the northern portion of the Medicine Bow Mountains to Woods post office at the edge of the Laramie plains, twenty-five miles from Laramie.

We had intended walking through to Laramie, but ninety miles and two mountain ranges in three days, not to mention the writer's terribly blistered feet, had temporarily taken some of the ambition out of us, and after some fine diplomacy D. and the writer each found that the other was willing to descend to stage coach riding. We accordingly sold our fine little pony for five dollars, packed our outfit in a compact bundle which we wrapped in our small tent (which had been used as a smoke-house for curing venison at *Elk River Camp*), and took the stage for Laramie.

At Laramie we took the train for home, and with eyes eagerly awake we watched for hundreds of miles an increasing luxuriance of vegetation which reached its climax in the marvel-



In the Range of the Rabbit's Ear.

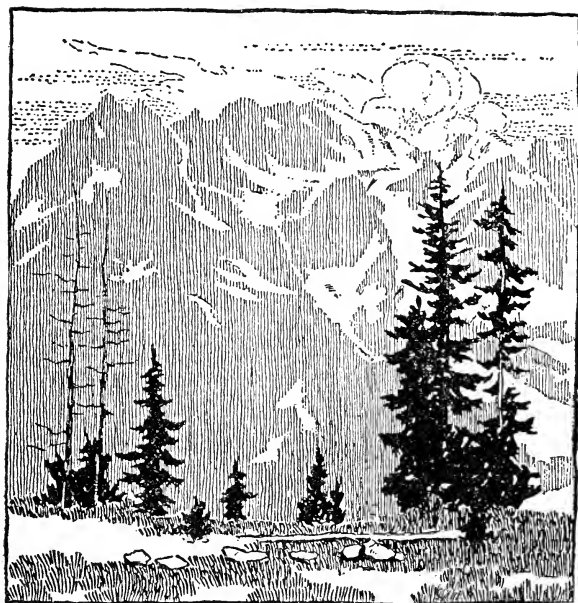
ously rich, endless, undulating fields of eastern Nebraska and Iowa:

This is the land that the sunset washes  
These are the Waves of the Yellow Sea;  
Where it arose and whiter it rushes,  
This is the western mystery.

We had been away from home for thirty-three days, and in the mountains for thirty-one nights—Indians reckon by nights; and we had tramped more than three hundred and fifty miles from Loveland to the edge of the Laramie plains. A large portion of the time was spent at high altitudes where the weather is not lamb-like in June, and no small portion of the three hundred and fifty miles was mud and water, snow and fallen timber, through a country as rough, perhaps, as is to be found anywhere, and as interesting. The only way to study Geography is with the feet! No footless imagination can realize the sublimity of western Mountain and Plain. Nothing but a degree of hardship can measure their wide-spread chaos and lonely desolation, and only the freshened eagerness of many mornings can perceive their matchless glory.

We reached home weather-beaten almost be-





Near Frying Pan Meadow.

yond recognition, but in robust health, especially D., who had actually gained in weight during the trip. From the railroad station we carried our outfit, and venison, two miles to the college grounds, reaching D.'s home about midnight.

Here our madly exuberant spirits were suddenly checked by finding that the illness of D.'s mother had become extremely serious. However she was determined to see us both—to give a last approval.

“ We never know how high we are  
Till we are called to rise;  
And then, if we are true to plan,  
Our statures touch the skies.

“ The heroism we recite  
Would be a daily thing,  
Did not ourselves the cubits warp  
For fear to be a king.”

After four days D.'s mother died. It fell to B. and F. to make a sculptor's plaster mask, and photographs; and to F. to watch overnight—and hasten to the woods in the morning.

“ The bustle in a house  
The morning after death  
Is solemnest of industries  
Enacted upon earth.

“ The sweeping up the heart  
And putting love away  
We shall not want to use again  
Until Eternity.”

A beautiful Campanile now stands on the college campus erected in memory of D.'s mother by the state of Iowa; and from this memory-tower a chime of bells

Greets  
Those who pass in joy  
And those who pass in sorrow;  
As we have passed,  
Our time.

“ Superiority to fate  
Is difficult to learn.  
'Tis not conferred by any,  
But possible to earn  
A pittance at a time,  
Until, to her surprise,  
The soul with strict economy  
Subsists till Paradise.”



## THE USES OF HARSHIP.

Did you chance, my friends, any of you, to see, the other day, the 83rd number of the *Graphic*, with the picture of the Queen's concert in it? All the fine ladies sitting so trimly, and looking so sweet, and doing the whole duty of woman—wearing their fine clothes gracefully; and the pretty singer, white-throated, warbling “Home sweet home” to them, so morally, and melodiously! Here was yet to be our ideal of virtuous life, thought the *Graphic*! Surely we are safe back with our virtues in satin slippers and lace veils—and our Kingdom of Heaven is come *with* observation!

RUSKIN.



Ruskin has said that the children of the rich often get the worst education to be had for money, whereas the children of the poor often get the best education for nothing. And the poor man's school is hardship.

It is generally admitted that wealthy American parents are too indulgent towards their children. However this may be, many an American father is determined that his sons shall not go through what he himself went through as a boy, forgetting that the hardships of his youth were largely the hardships of pioneer life which have vanished forever. No boy with good stuff in him and with a fair education unmixed with extravagant habits of living can possibly have more hardship nowadays than is good for him. Every young man must sooner or later stand by himself; and hardship, which in its essence is to be thrown on one's own resources, is the best school.

But the most alluring school of hardship, a sort of Summer School of the University of Hard Knocks, is a walking trip into the mountains to the regions of summer snow, carrying one's whole outfit on one's back as did the Kansas

boys of '89, or indulging in the ownership of a pack-pony and a miner's tent as did D. and the writer in '95. The hardships of such a trip are of the old old type, the facing of all kinds of weather and the hunting for food, and they waken a thousand-fold deeper response than the most serious hunt for a job in a modern city.

# THE PUBLIC SCHOOL

DENMARK HILL, April 1st, 1871.

*My Friends:*

It cannot but be pleasing to us to reflect, this day, that if we are often foolish enough to talk English without understanding it, we are often wise enough to talk Latin without knowing it. For this month retains its pretty Roman name, which means the month of Opening; of the light in the days, and the life in the leaves, and of the voices of birds, and of the hearts of men.

And being the month of Manifestation, it is pre-eminently the month of Fools;—for under the beatific influence of moral sunshine, or Education, the Fools always come out first.

But what is less pleasing to reflect upon, this spring morning, is, that there are some kinds of education which may be described, not as moral sunshine, but as moral moonshine; and that, under these, Fools come out both First—and Last.

We have, it seems, now set our opening hearts much on this one point, that we will have education for all men and women now, and for all girls and boys that are to be. Nothing, indeed, can be more desirable, if only we determine also what kind of education we are to have. It is taken for granted that any education must be good;—that the more of it we get, the better; that bad education only means little education; and that the worst we have to fear is getting none. Alas that is not at all so. Getting no education is by no means the worst thing that can happen to us. The real thing to be feared is getting a bad one.

RUSKIN.

The recent exchange of visits between Pennsylvanians and Wisconsinites has resulted in the organization of an association for the carrying out of the Wisconsin Idea in Pennsylvania; but the New York *Evening Post*, in commenting upon the Pennsylvania version of the Wisconsin Idea, calls attention to the fact that in Wisconsin the idea is carried into effect by public agencies, whereas the Pennsylvania version is to be executed privately! The *Evening Post* did not, indeed, say execute; I, myself, have introduced the word, because it so exactly conveys the meaning of the *Post's* criticism.

Why is it that so many good people take up things like the Boy Scout movement, privately, never giving a moment's thought to our rusting school machinery? Why are we so privately minded as to enthuse over Mrs. so-and-so's out-of-the-city movement for children, never thinking of the *potentialities* of establishments like Girard College? The trouble is that we Americans have never learned to do things together; we still have the loyal but lazy habit of looking expectantly for a King, and, of course, we get a Philadelphia Ring, the lowest Circle in the

Inferno of the Worst; and all the while our might-be doers of good affect a kind of private Kingship, and sink into a mire of idiotic\* impotence.

The seven wonders of the world all fade into insignificance in comparison with one great fact in modern government, a fact so fundamental that we seldom think of it, namely, the great fact of taxation. Funds sufficient to meet every public need of the community flow automatically into the public treasury. This is indeed a very remarkable thing, but it seems almost ludicrous when we consider that wasteful expenditure of public funds is the universal rule, and that good people everywhere are struggling to do public things privately! Was there ever before two such horns to a dilemma? Fog horns, grown inwardly on every Pennsylvanian's head! When a city of 10,000 people has an annual school budget of \$60,000, it is evident that everything can be done that needs to be done for the schooling of children.

I believe that the school day should be increased to 8 hours, the school week to 6 days, and the school year to 12 months; with elastic

\* Among the Greeks an idiot was a man who thought only of his private affairs, a privately minded man.

provision for home work and out-of-town visiting. I believe that school activities should include a wide variety of simple hand work, and a great deal of out-door play, with ample provision for the things that are done by Boy Scouts and Camp Fire Girls; and when children are old enough and strong enough to begin their vocational training, their school activities should be combined with work in office and factory. Let no one imagine that such a program is impracticable; for in the city, school is the sum of all influences outside the home, and the school day is now more than eight hours, the school week is more than six days, and school lasts the whole year through; these are the facts, say what you will; and everything is in a dreadful state of confusion—excepting only book work. *It is time for us to think of the public school as including everything which makes for the efficient organization and orderly control of the juvenile world.* The Junior Municipality, which has been recently proposed, added to existing school work with provision for simple manual training and outdoor play would constitute a fairly complete realization of this wide conception of the public school, and any narrower conception is hopeless in a modern city.

As to educational values there is a widespread misunderstanding. Imagine a teacher taking his children on a hike two or three times a week all Winter long! Every parent, *hoping for his children to escape the necessity of work*, would howl in stupid criticism "Is that what I send my children to school for?" Or the school superintendent might have the point of view of the excessively teachy teacher, who, in a recent discussion of the Boy Scout idea, admitted that outdoor activity would be a good thing—provided something were done to justify it!—and that something was understood to be bookish! As to vocational training, on the other hand, we must reckon with the manufacturer who will not train workmen for his competitors, but who expects his competitors to train workmen for him. And we also must reckon with the ministerial member of the school board who meets a proposal for vocational training with the question "How then will you educate for life?"

"Ich ging im Walde  
So fuer mich hin  
Und nichts zu suchen  
Das war mein Sinn."

Children who go for nothing will get everything; and to be fit for service is to be fit for life.



















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